

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re the application of:

Akio KONISHI

Serial No.: NEW

Filed: August 23, 2001 (herewith)

For: APPARATUS FOR FABRICATING POWDERY THERMOELECTRIC  
MATERIAL AND METHOD OF FABRICATING POWDERY  
THERMOELECTRIC MATERIAL USING THE SAME

**PRELIMINARY AMENDMENT**

Honorable Commissioner  
of Patents and Trademarks  
Washington, D.C. 20231

August 23, 2001

Dear Sir:

Prior to an examination on the merits, please amend the above-identified application as follows:

IN THE SPECIFICATION:

Please replace the paragraph at page 10, lines 14-23, with the following rewritten paragraph:

-- At first, a starting (or raw) material having a predetermined composition is weighed and is enclosed in a vessel 1 (step S1). The starting (or raw) material of the thermoelectric material contains, for example, antimony (Sb) or bismuth (Bi) being a group V element and Selenium (Se) or tellurium

(Te) being a group VI element. Since the solid solution of the group V and group VI elements has a hexagonal system (crystal) structure, at least two of elements among Bi, Te, Sb and Se are used as the raw materials generally represented as follows: --

Please replace the paragraph beginning at page 11, line 8, with the following rewritten paragraph:

-- Then, the starting or raw material enclosed in the vessel 1 is heat-melted by a radio frequency coil or a heater or the like (step S2). Further, the molten metal of the heat-melted raw material is poured through the funnel 2 on the rotating disk 3 (step S3). The rotating disk 3 is connected with the motor 4 and controlled for the rotational speed. The poured molten metal 5 is scattered by the rotating disk (step S4). The scattered molten metal 6 is cooled, dropped in the chamber 8, and then collected in the powder collecting portion (unit) 7 (step S5). For the method of pouring in step S3, the molten metal may be dripped dropwise or may be flowed continuously from a pouring port. --

Please replace the paragraph at page 12, lines 18-21, with the following rewritten paragraph:

-- The Figure of Merit  $Z$  indicating the performance of the thermoelectric material is represented by means of Seebeck coefficient  $\alpha$ , electric conductivity  $\sigma$ , and thermal conductivity  $\kappa$ , as follows: --

Please replace the paragraph beginning at page 12, line 3 from the bottom, with the following rewritten paragraph:

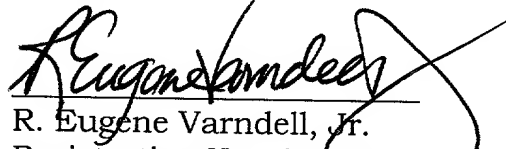
-- When the Figure of Merit Z is higher, the performance of the thermoelectric material is better. The thermoelectric material is generally prepared from a sintered material and the heat conductivity can be decreased by reducing the crystal grain size of the sintered material finer. Accordingly, when the sintered material is prepared by using a fine powdery thermoelectric material fabricated in accordance with this invention, a thermoelectric material of a high Figure of Merit can be fabricated. That is, the performance of the thermoelectric material can be improved and the productivity of the high performance thermoelectric material can be improved. --

#### REMARKS

Applicant's specification was amended to correct editorial matters. Attached hereto is a marked-up version of the changes made to the specification by the current amendment. The attached pages are captioned **"VERSION WITH MARKINGS TO SHOW CHANGES MADE."** Early consideration and allowance of Claims 1-4 are respectfully requested.

In the event any additional fees are due, please charge our Deposit  
Account No. 22-0256.

Respectfully submitted,  
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(formerly Varndell Legal Group)

  
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**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

**IN THE SPECIFICATION:**

The paragraph at page 10, lines 14-23, was amended as follows:

-- At first, a [raw] starting (or raw) material having a predetermined composition is weighed and is enclosed in a vessel 1 (step S1). The [raw] starting (or raw) material of the thermoelectric material contains, for example, antimony (Sb) or bismuth (Bi) being a group V element and Selenium (Se) or tellurium (Te) being a group VI element. Since the solid solution of the group V and group VI elements has a hexagonal system (crystal) structure, at least two of elements among Bi, Te, Sb and Se are used as the raw materials generally represented as follows: --

The paragraph beginning at page 11, line 8, was amended as follows:

-- Then, the starting or raw material enclosed in the vessel 1 is heat-melted by a radio frequency coil or a heater or the like (step S2). Further, the molten metal of the heat-melted raw material is poured through the funnel 2 on the rotating disk 3 (step S3). The rotating disk 3 is connected with the motor 4 and controlled for the rotational speed. The poured molten metal 5 is scattered by the rotating disk (step S4). The scattered molten metal 6 is cooled, dropped in the chamber 8, and then collected in the powder collecting portion (unit) 7 (step S5). For the method of pouring in step S3, the molten metal may be dripped dropwise or may be flowed continuously from a pouring port. --

The paragraph at page 12, lines 18-21, was amended as follows:

-- The [figure] Figure of Merit Z indicating the performance of the thermoelectric material is represented by means of Seebeck coefficient  $\alpha$ , electric conductivity  $\sigma$ , and thermal conductivity  $\kappa$ , as follows: --

The paragraph beginning at page 12, line 3 from the bottom, was amended as follows:

-- When the Figure of Merit Z is higher, the performance of the thermoelectric material is better. The thermoelectric material is generally prepared from a sintered material and the heat conductivity can be decreased by reducing the crystal grain size of the sintered material finer. Accordingly, when the sintered material is prepared by using a fine powdery thermoelectric material fabricated in accordance with this invention, a thermoelectric material of a high Figure of Merit can be fabricated. That is, the performance of the thermoelectric material can be improved and the productivity of the high performance thermoelectric material can be improved. --